

Cryogenic Magnetostrictive Actuators: Materials and Applications.

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Magnetostrictive actuators based on TbDy alloys show great promise for use as actuators in cryogenic devices. They can be made to deliver large forces and useful displacements below liquid nitrogen temperatures, with many advantages over piezoelectric actuators and motion feedthroughs from higher temperature. We will present our most recent developments in materials processing and characterization, including the development of polycrystalline materials which show substantial magnetostriction and can be produced at much lower cost than single-crystal materials. We will also show several magnetostrictively actuated devices intended for use at low temperature: A liquid helium valve which has been demonstrated to be leak tight at 4.2 K; a filter wheel for use with infrared and microwave optical devices; and a mechanical heat switch for use with cryogenic apparatus which require both good thermal isolation and the ability to change temperature quickly.